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NOTES ON THE HABITS OF SOME CENTRAL AMERICAN STINGLESS BEES.[1]

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While collecting insects in Central America during the winter of 1911–'12, I was impressed with the great diversity of behavior among the Meliponine, or stingless bees of the genus *Trigona*. Prof. Cockerell has had the kindness to study and identify the specimens I collected and as his paper appears in this number of Psyche it seemed opportune to publish my field notes at the same time. These notes comprise only such observations as I was able to make while devoting most of my attention to other insects and therefore contain little on the internal structure of the nests, which can be studied only at the expense of much time and labor. This part of the subject, however, has been ably treated by two observers in South America, Silvestri.[2] and H. von Ihering[3] Ducke has also contributed some notes on the Brazilian Meliponinæ, especially on the flowers which they visit.[4]

The observations of these authors are cited, because several of the Trigonas of Central America are also members of the South American stingless bee fauna.

Trigona amalthea Olivier.

A large colony of this black species was found nesting in the base of a tree near Escuintla, Guatemala. The nest was situated a few feet from the ground and had a rather convoluted, spout-shaped entrance of black wax (cerumen) projecting between two of

[1] Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University. No. 61.

[2] Contribuzione alla Conoscenza dei Meliponidi del Bacino del Rio de la Plata, Riv. Patol. Veget. X, 1902, pp. 121–170, 2 pls.; 19 text figs.

[3] Biologie der stachellosen Honigbienen Brasiliens. Zool. Jahrb. Abth. f. Syst. XIX, 1903, pp. 179–287, 13 pls., 8 text figs.

[4] Die Stachellosen Bienen (*Melipona* Ill.) von Pará. Zool. Jahrb. Abth. f. Syst XVII, 1902, pp. 285–328, 1 pl.)

the tree's buttresses. The colony was apparently about to swarm, as the air about the nest was full of bees flying back and forth in zig-zag paths like those described by some dancing Empidid flies. A compact mass of the insects had settled to one side of the entrance spout. On putting my tweezers into this mass I was at once enveloped in a cloud of loudly humming bees, which, however, did not settle on my body but kept darting against my face and hands, often falling over on their backs onto the ground or onto my clothing. They moved very rapidly and as if intoxicated. At the same time they emitted a distinct rancid-butter odor, like that of the ants of the genera *Tapinoma* and *Azteca*. On my moving away to a distance of about 40 feet, they all left me quite suddenly and returned to their nest.

According to Silvestri, this species may also bite, but its mandibles are feeble and innocuous. Von Ihering describes it as a "very wild" bee and as often visiting carrion, cow-dung or other excrement. He gives its native Brazilian name as "sanharó."

Trigona nigerrima Cresson.

A few specimens of this, the largest species seen, were taken on flowers in the banana plantations at Quirigua, Guatemala.

Trigona jaty F. Smith.

This small, slender, honey-yellow species is common in western Guatemala, at Escuintla and Patulul, nesting in crevices between the buttresses or bark-ridges of large trees and between the clap-boards of houses. In the latter situations it seems to prefer the corners where the clap-boards abut on the door and window frames. The nest entrance is a spout, sometimes fully an inch long but only about the diameter of a lead-pencil, either cylindrical or somewhat flattened and occasionally twisted. The wax of which this spout consists is pale yellow and as thin as paper, so that it collapses when rudely touched, especially when the temperature is high. In the early morning the bees are often seen flying in a small compact swarm just in front of the entrance, all with dangling legs and with their faces turned towards the opening. They are extremely timid and when disturbed at once retreat into the opening and cannot be induced, by poking straws, etc. into it, to come out and defend their nest. The natives of Guatemala call these little bees

which are common about the houses, "ingleses," *i.e.* Englishmen, "because they wear black leggings." [1]

Silvestri gives a good description of the nest of *T. jaty* and says that a colony yields about $\frac{1}{4}$ litre of very sweet and aromatic honey. Both he and von Ihering, who also gives a detailed account of its nest, call attention to its very timid behavior. He records the interesting fact that it usually closes its nest spout at night with a convex waxen door, which is removed in the morning.

Trigona pallida Latreille.

This light-yellow species was common at a spot near Gatun, C. Z. on the relocated Panama R. R., where it exhibited a most extraordinary habit. At a wet ravine on one side of the track a barrel of black crude oil (with asphalt basis) had been placed as a supply for the men employed in exterminating mosquito larvæ and pupæ, and near it was a bucket which had been filled from the barrel. Perched around the rim of this bucket and crawling about the leaking spigot in the flat end of the barrel were great numbers of the bees, loading themselves with the oil! They could be seen collecting the oil with their fore legs and then transferring it to their dilated hind tibiæ. In this occupation many had succeeded in daubing their whole body, including the wings, with the sticky, strong-smelling substance, and at first sight seemed to be trying to convert themselves into pitch-black Trigonas. They were not, of course, really endeavoring to adopt the prevailing style of coloration among the Central American species, but were merely collecting the oil for the purpose of kneading it up with their own waxy secretions, to form the cerumen with which they build their honey pots, brood-combs and nest entrances.

Trigona cupira F. Smith.

A single colony of this black species was discovered by my wife in an orchard at Zacapa, Guatemala, nesting in the ground. The orifice, about an inch in diameter was made of clay and was arched like the door of an oven. It was guarded by a number of workers, all sitting with their faces towards the outside. When I broke into the nest with my trowel, the bees attacked me furiously,

[1] Possibly the reference is to "shoes" instead of to "leggings," since the native Guatemalans go bare-footed.

humming loudly and getting into my hair, eyebrows, moustache, eyes, ears and nostrils and biting my neck. Their jaws, however, were very feeble and the attack was far more ludicrous than disagreeable. At Guatemala City, in the bottom of one of the deep barrancas which nearly surround the town, I saw many workers of this same species collecting moist mud at the edge of a stream.

According to Ducke, *T. cupira* is common in Pará, especially on Papilionaceæ and Mimosaceæ. It works during the cooler hours of the day, *i. e.* in the morning and in the evening. He remarks that it has a pleasant odor like that of roses and that its honey is palatable and wholesome. Both Silvestri and Ducke maintain that it nests in trees as well as in the ground. The former saw it licking up the honey dew discharged by some Homoptera (*Æthalion reticulatum* L.) living on willows. Von Ihering gives a full description of the nest and records the native Brazilian name of this bee as "iraxim."

Trigona perilampoides Cresson.

A few workers of this species were taken on flowers near Esquintla, Guatemala.

Trigona fulviventris Guérin.

Single workers were taken on flowers at Zacapa and at Puerto Barrios, Guatemala. Prof. Cockerell has sent me a specimen of this bee taken at Guatemala City by Mrs. W. P. Cockerell.

Trigona frontalis Friese.

This is a very small species, measureng scarcely more than 3 mm. in length. It was found nesting in the narrow cracks of the wooden pillars of the corridor surrounding the "patio" of a hotel at Patulul, Guatemala. Each colony comprises only a few dozen workers, which close the crack with a diaphragm of pale yel'ow wax and leave a round hole only 1.5–2 mm. in diameter, just large enough to permit them to enter or pass out one at a time. They are extremely timid, hastily retiring into the nest at the slightest sign of danger and remaining in it many minutes before again venturing forth. By tearing away the diaphragm with the points of my tweezers I was able to watch the bees with a pocket lens in the act of reconstructing it from the inside. This they accomplished in about 20 minutes. Again and again I tore down their

work but they rebuilt it each time, till finally, after spending some hours in this destructive employment, my patience was exhausted and I left the little creatures to enjoy their harmless and unobtrusive existence.

Trigona townsendi Cockerell.

The single specimen of this minute bee, which was submitted to Prof. Cockerell, was taken from a nest of *T. frontalis* at Patulul, Guatemala together with several workers of this latter species. It is therefore, in all probability, an inquiline, which, like so many inquilinous or parasitic bees and ants, resembles its host in size and coloration.

Trigona stigma F. Smith.

I saw a populous colony of this singular, slender bee nesting in the trunk of one of the large poisonous manzanilla trees which are common along the sea-beach at Las Sabanas, near Panama City. The entrance of the nest, which was about six feet above the ground, was a slit-shaped hole about $\frac{1}{2}$ inch long and not provided with a waxen or cerumen spout. When I discovered the nest, a compact swarm of the insects was poised in the air at the entrance, all oriented with their heads towards the hole and their long hind legs dangling. On being disturbed they made no attempt to attack me. By sweeping my hand through the swarm I could collect large numbers, but my hand became very sticky with a colorless propolis which the insects were carrying on their hind legs. A few hours later, when I again passed the tree, the swarm had disappeared. In life the slender abdomen of this bee is of a peculiar livid white color, but in dried specimens it often turns black like the remainder of the body.

Trigona bipunctata wheeleri Cockerell.

At Patulul, Guatemala, I came upon a colony of this species nesting in the trunk of a large *Acacia*. The entrance spout was made of yellowish brown cerumen. When disturbed, the bees flew at me but, to my surprise, they neither settled on nor bit my face and hands but rested amicably on my skin and clothing, till I had walked a few paces from the nest, when they all left me. This bee was frequently seen about Escuintla visiting human excrement along the railroad tracks and carrying it away for use in the manu-

facture of cerumen. At Patulul I saw it similarly engaged in large numbers in an open latrine. This, as also the similar habit of *T. ruficrus corvina* described below, raises the question as to whether some of the baneful effects recorded by South American observers as the result of eating the honey of stingless bees, may not have been due to pathogenic bacteria which had been worked by the bees into the cerumen walls of their honey pots and had contaminated their contents. At any rate, from what I have seen of this bee at Escuintla and Patulul, I have no doubt that, under certain conditions, it might become, like the house fly, a menace to public health through disseminating the germs of typhoid and other enteric diseases.

According to Silvestri, the typical *T. bipunctata* is called "tombuna," "mandaguay," or "tapezuá" by the natives of the La Plata Basin. The spout of the nest is described as being 8–15 cm. long and 3–5 cm. broad. Von Ihering gives the native Brazilian name of this bee as "tubuna" and calls attention to its hair-twisting proclivities. He says that it often annoys people also by alighting on their skin far from the nest and imbibing their perspiration. He notices its fondness for visiting carrion and excrement and its disagreeable odor.

Trigona pectoralis Dalla Torre.

A single colony of this bee was found nesting a couple of feet from the ground in the hole of a large tree growing on the bank of a very shady ditch near Escuintla, Guatemala. The entrance had a well-defined cerumen spout about an inch long. When disturbed the bees assaulted me and buzzed about in my hair, moustache and eyebrows. They all left me as soon as I had moved about 20 feet from the nest.

Trigona pectoralis panamensis Cockerell.

At Ancon, C. Z. this species was seen visiting the yellow flowers of a great curcurbitaceous vine which covers the entrance to the Hotel Tivoli. The bees were very numerous early in the morning and seemed to prefer the wilted and partially closed flowers. By 10 a.m. they had all diappeared and did not revisit the flowers till early the next morning.

Trigona ruficrus Latreille.

While collecting along the edge of a field near Zacapa, Guatemala, I found a huge nest of this species, lying on the ground at the foot of a tree from which it had been torn. At first sight this nest resembled that of a common termite (*Eutermes ripperti*), being elliptical, nearly 2 feet long and more than a foot wide and made of a dark, dry, earthy cerumen. My attention was attracted to it by columns of large leaf-cutting ants (*Atta cephalotes*) and fire ants (*Solenopsis geminata*). On following these I found that the nest had been torn open by some of the natives and that it contained a colony of *T. rufricus* which had been robbed of its honey. The ants were completing the ruin by imbibing the remnants of the honey and carrying off the softer and sweeter portions of the cerumen in little lumps. The defenceless bees had not deserted their abode but were vainly trying to repair the damage. They did not attempt to attack me.

Silvestri gives "irapuá" and "carabozá" as the native names of this bee in the province of Missiones. He describes and figures the structure of the nest in detail, and says that the bees bite savagely but without inflicting any pain. The honey is said to be purgative. Von Ihering gives the native Brazilian name of the insect as "irapoán." He also describes the nest in detail and states that the honey is "blackish brown, opaque, odorless, of unpleasant, nauseating, acridly sour taste, with strong acid reaction."

Trigona ruficrus corvina Cockerell.

This bee was seen near San José, Costa Rica and at Corrozal in the Canal Zone, busily collecting the sticky propolis from the surfaces of young orange leaves. But this insect is not always engaged in such cleanly work. At the garbage crematory at Gatun, C. Z. I saw it in great numbers mingling with the houseflies and blowflies inside the empty garbage barrels where it was collecting the malodorous moisture that still clung to the wooden staves. The honey of this bee, like that of *T. bipunctata*, *amalthea*, *argentata* and probably several other Central and South American Trigonas, may, therefore, be as unwholesome an article of human food as would be honey collected by houseflies, if these scavengers should suddenly become social and take to storing such a substance.

Trigona flaveola mediorufa Cockerell.

I found a colony of this beautiful fulvous bee at Escuintla, Guatemala, about four feet from the ground in the trunk of a large tree. There was no cerumen spout to the nest entrance which was a hole about $\frac{3}{4}$ inch in diameter, guarded by a company of workers, all with their shining yellow faces directed towards the outside. On carelessly thrusting my tweezers into the opening I was given a surprise for which my previous experiences with stingless bees had not prepared me. They rushed at my face, neck and hands in a compact swarm, emitting a scalding liquid which had the rancid-butter odor of the ants of the genus *Tapinoma*. They bit my ears and nearly blinded me by getting into my eyes, so that I had to beat a hasty retreat. Only after I had moved about 30 feet from the nest did they all leave me and return to settle down again in the nest entrance in the defensive attitude in which I had first seen them. The action of the liquid on my skin was very annoying, for all the spots on my cheeks, eyelids and hands which the bees had moistened, remained sensitive and painful to the touch for several days and in the course of the next two weeks lost their epidermis as if violently sun-burned.

T. flaveola mediorufa belongs to a group of Trigonas popularly known in Brazil as "cagafogos" (literally "fire-defecators") and including *T. tataira* Smith (*cacafogo* F. Müller) and the typical *flaveola* Friese. There seems to be considerable difference of opinion as to the source of the scalding liquid with which these insects so efficiently defend their nests. Von Ihering did not observe the Brazilian species *T. tataira*, but assumes from the statements of other observers "that the bee bites a small hole in the skin with its mandibles and then injects the secretion of its poison glands into this wound. In this manner arises a red spot 1 mm. in diameter, where the epidermis is lacking. It takes one or two weeks for the little wound to heal completely." Silvestri describes his experience with the typical *T. flaveola* Friese, which he calls the "cagafoga" as follows: "I came upon a nest of this species in a dead tree trunk near the River Cuyabá. On approaching it I was assaulted by a few of the bees, which bit various parts of my head. As these bites produced a slight burning sensation and as I was not provided with protective apparatus, I deemed it imprudent to expose myself to the attack of a greater number of

individuals. The burning sensation of the bite is due to the nature of the saliva, which seems to contain a great deal of formic acid; at any rate, the odor reminded me strongly of that substance."

One is, of course, hardly in a proper frame of mind during an assault of these terrible bees to make accurate observations on the source of their caustic secretion. I am convinced, nevertheless, that the liquid, of *T. flaveola* at least, comes from the posion (anal) glands and not from the mouth as Silvestri supposes, because the odor is precisely like that of the poison glands of the Dolichoderine ants (*Tapinoma*, *Azteca*, *Liometopum*, etc. and of some other insects with anal glands [Carabidæ]). The secretion is not, however, applied in the manner described by von Ihering, because the bees did not make small holes in my epidermis, but simply spread the liquid over it in considerable quantity, so that the surface was quite wet. Hence, after the attack, the cuticle was not reddened in definite small patches but was diffusely flushed over larger areas as in case of sun-burn.